

REMARKS

The Non-Final Office Action mailed August 20, 2008 and the references cited therein have been carefully considered. Claims 1-26 are now pending in the application, of which Claims 22 and 24-26 have been withdrawn from consideration. Claims 11 and 17 have been amended to clarify that which Applicants regard as the invention. The amendments to Claims 11 and 17 are intended to removed language objected to by the Examiner in the subject Office Action and not intended to further limit the scope of the claims, particularly in view of the cited prior art. Thus, no new matter has been added by these amendments.

Applicants appreciate and acknowledge the indication of allowable subject matter, particularly Claims 12-15 and 21 as indicated in the subject Office Action.

Claim Objections

In the Office Action, Claims 11 and 17 were objected to the phrases “more than 300 lines per mm, in particular a spatial frequency of” and “preferably”, respectively. Applicants have hereby deleted such phrases and therefore request that this rejection be withdrawn.

Claim Rejections under 35 USC § 103

Claims 1-11, 16-20 and 23 have been rejected under 35 U.S.C. §103(a) as being unpatentable over DE 10044465 to **Mueller**. The Office Action proposes that Mueller discloses all the elements of the rejected claims, with the exception of the specific ranges recited in Claims 1 and 14. Applicants respectfully traverse this rejection as set forth more fully below.

Mueller discloses a data support with an embossed structure and a coating (print) that contrasts with the surface of the data support, whereby the print is applied in the area of the embossed structure. The embossed structure and the print are combined so that partial areas of the coating are completely visible when viewed from a vertical position, but concealed when viewing at an angle (oblique viewing). In this way, a different optical effect arises upon alternate perpendicular and oblique viewing (see, Mueller paragraph [0001]).

The basic functional principle of the optical effect of the data carrier according to Mueller is made clear, e.g., in Fig. 2 of Mueller: The left flanks of the embossed structure 18 carry a coating 4. Upon perpendicular viewing (viewing direction A), the viewer recognises the printed screen 4, i.e. the line structure of the printed screen 4. Upon oblique viewing from viewing direction B, i.e. when viewing the flanks carrying the print 4, the viewer perceives an almost uniform colored print. In viewing direction C, i.e. when viewing in direction to the flanks of the embossed structure which do not carry a print, the viewer perceives none or only a fraction of the print 4 (see also, paragraph [0049] of Mueller).

Thus, the embossed structure taught by Mueller is not a diffraction grating, but acts in a refractive manner. The optically variable effect of the device according to Mueller is produced by the concealment of the print by the neighbouring structure elements of the embossed structure whereby said concealment is limited by a specific viewing angle. A diffraction grating is considered by a skilled person in the field of optical security elements to be an arrangement of a plurality of diffraction elements which are suited and defined to generate optically variable

effects by diffraction of the incident light, which is exactly not the case in the arrangement according to Mueller. The tilting effect taught by Mueller is not based on the diffraction of light. Furthermore, the embossed structure according to Mueller is embossed into the paper of a banknote and printed with a colored line pattern of between 25 μm and 300 μm (see, Mueller col. 2, lines 43-45, i.e. 1.25 to 20 lines per mm). This structure is not suited to form a diffraction grating in a security element.

Further, Mueller does not disclose a diffraction grating defined by the relief parameters relief shape, relief depth, spatial frequency and azimuth angle whereby the relief parameter relief depth is varied periodically in accordance with a periodic parameter variation function. The Examiner's attention is directed to Fig. 6a of the instant patent application, in comparison to Fig. 2 of Mueller. The instant Fig. 6a shows a relief structure 61 with a constant spatial frequency $1/\text{period } 62$, whereby the profile depth of the relief structure 61 is varied by a periodic parameter variation function with a period 63. The basic form (F) of a period 62 (e.g., $F = t * \sin(P1)$) defined by means of the relief parameters relief shape (sine), spatial frequency ($1/\text{period } 62$), azimuth angle and relief depth (t) is varied by variation of the parameter relief depth (t) by means of a sine-shaped parameter variation function ($t = k + l * \sin(P1)$) of a period 63, so that the relief shape shown in Fig. 6a is finally produced. The parameter variation function is not the function that describes the basic shape of the diffraction grating but a function which varies one or more parameters of this basic shape (i.e., the relief depth). It is the relief parameter relief depth defining the diffraction grating which is varied by means of the parameter variation

function. In this way, a parameter (p) of a function ($F(p)$) is varied, which defines the diffraction grating and not directly the function result z , i.e. the local embossing depth: $z = F(p)$.

Accordingly, Mueller fails to teach or reasonably suggest all the elements of the claimed invention.

What is more, one of ordinary skill in the art would not design the embossed structure taught by Mueller as a diffraction grating. A basic teaching of Mueller is to combine an embossed structure and print (a coating) in register with the embossed structure so that a part of the print is concealed by the embossed structure for a viewer (Mueller claim 1). A precondition for this is that the embossed structures are chosen with regard to their dimensions so large that their flanks can be aligned with a printed line pattern. Further, the data carrier shown in Fig. 2 of Mueller acts in a refractive manner, as this is the only way the “concealment effect” can be achieved. With a diffraction grating, the intensity of the back diffracted light is substantially determined by the spatial frequency and not by the angular position and design of the flanks of the diffraction grating. Thus, with a diffraction grating, the refractive “concealment effect” taught by Mueller would not come into effect. Accordingly, Mueller teaches away from using a diffraction grating as an embossed structure.

The Examiner’s attention is further directed to Figs. 3-5 of Mueller. A constant printed screen is laid over areas, where the flanks of an embossed structure are mutually phase-shifted. In this way, one area of the right flanks of the embossed structure carry the print and another area of the left flanks of the embossed structure carry the print. Thus, the concealment effect occurs

in one area when viewing from one side and in the other area when viewing from the other side. The two different areas can provide a different optical impression. However, the shift of lines from the diffraction grating in neighbouring areas for a fraction of a period does not produce a different optical appearance in the two areas (spatial frequency, azimuth angle and relief shape are identical). The angular position of the diffraction maxima are substantially determined by spatial frequency. This illustrates how the present invention and the teachings of Mueller are based on different functional concepts and different physical phenomena which, as mentioned above, lead to different results. Accordingly, one of ordinary skill would not alter the teaching of Mueller in order to arrive at the claimed invention.

Additionally, there is no reason for one of ordinary skill to modify or alter Mueller to provide an embossed structure wherein the relief parameter relief depth – given a relief structure which is defined by the relief parameters relief shape, relief depth, spatial frequency and azimuth angle – is varied according to a periodic parameter variation function. This is immediately apparent when comparing Fig. 6a of the instant application with Fig. 2 of Mueller. By means of variation of the relief depth, the steepness of the flanks and the length of the flanks change so that a registration of the print in a way that only one flank of the embossed structure carries a print is not possible anymore. Taking this approach, the concealment effect would not occur anymore for all the structure elements of the diffraction structure and the functional concept of Mueller, at least partially, would not be fulfilled. Thus, one of ordinary skill would not be motivated to alter Mueller in this way.

Mueller does disclose that the print screen and the embossing screen do not have to run linearly, but can also be provided in the form of wavy lines. However, with regard to this variant, Mueller does not teach or reasonably disclose that in a background area and in a background pattern area, the relief parameter azimuth angle is varied corresponding to mutually phase-shifted parameter variation functions. In the embodiment according to Fig. 3 and Fig. 4, the partial embossed structures are mutually shifted for a percentage of the screen width so that different flanks and partial areas of flanks, respectively, each carry the print. A comparison of Fig. 4 of Mueller with Fig. 2b of the present application, shows this phase-shift of neighbouring screens does not correspond to a phase-shift of the parameter variation functions which vary the azimuth angle. Thus, if one of ordinary skill in the art were to design this embossed structure in the form of a wavy line, he/she would follow the teachings illustrated in Fig. 4 and position the wavy lines mutually shifted for a fraction of the screen width in the different areas. The skilled artisan would not vary the azimuth angle in these areas by means of mutually phase-shifted parameter variation functions (e.g., see the line shape according to Fig. 2b of this application). Fig. 5 of Mueller also shows an embodiment wherein the screens in two areas are mutually shifted for a fraction of a period. Figs. 6-9 show embodiments where the angular position of the screens are mutually shifted in neighbouring areas, which would also lead the skilled person away from the present invention. By applying this to a screen with a wavy line form, the wavy lines in the different areas would be mutually shifted in an angle, a skilled person would use in the areas, e.g., mutually orthogonal wave-line patterns.

Once again, the security element of Mueller is based on a refractive concealment effect whereas the security element of the present invention is based on a diffraction grating that provides an optically variable effect through the diffraction of the incident light. In this sense, the mutual shift, e.g., of the lines of the diffraction grating, in accordance with the present invention, leads to a disturbing scattering effect in the border area. However, it has a decisive effect on the optical result with the security element of Mueller (Fig. 4).

Consequently, a person of ordinary skill in the art taking into account and possibly altering the teachings of Mueller would not arrive at the present invention as recited in the claims, and particularly independent claims 1 and 21. Accordingly, Applicant hereby respectfully requests reconsideration and withdrawal of the current rejections of the claims under 35 U.S.C. §103(a) as being unpatentable over Mueller.

Conclusion

Applicant submits that the claims, particularly independent claims 1 and 21, are clearly distinguishable from the cited prior art references. Also, claims 2-20 and claims 22-24, which ultimately depend from Claims 1 and 21, respectively, are similarly patentable over the art of record by virtue of their dependence. Also, Applicant submits that Claims 2-20 and claims 22-24 define patentable subject matter in their own right. In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration and allowance of the claims presented.

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If the Examiner has any questions or suggestions to expedite allowance of this application, she is cordially invited to contact Applicants' attorney at the telephone number provided.

Respectfully submitted,

/tony a. gayoso/

Tony A. Gayoso

Registration No.: 37,331

Attorney for Applicants

HOFFMANN & BARON, LLP
6900 Jericho Turnpike
Syosset, New York 11791-4407
(516) 822-3550

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